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ABSTRACT

Though technical writing as a profession began only recently (shortly after World War II), its tradition goes back to ancient times. This paper describes how technical writing teachers at New Mexico State University use the works of twenty scientific writers included in the "Great Books of the Western World" series to demonstrate to their students the impact of scientific writing throughout world history. Following this introduction, the students are asked to read selections from the "Great Books" series that relate to their college majors and to write summaries of what they read. The paper concludes with the hope that this background information will inspire students to carry on the tradition of scientific writing in their own work. (RL)

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TEACHING THE TRADITION OF SCIENTIFIC WRITING

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ABSTRACT

The scientific volumes of The Great Books of the Western World provide convenient sources for teaching the tradition of scientific writing. Students do not know that a long and great tradition of scientific writing exists. In technical writing classes at NMSU, students learn that the tradition dates back to ancient times and that the tradition is great enough for 20 scientific writers to be included in The Great Books. The students become familiar with the great scientific writers and examine practical exemplars for writing from Hippocrates, Euclid, Nicomachus, Ptolemy, Copernicus, Darwin, and Freud among others.

The title of this session, The Use of Technical and Scientific Literature in the Teaching of Technical Writing, is particularly applicable to the technical writing courses taught at New Mexico State University. Each semester in the second class period of technical writing courses at NMSU, we discuss what we call The Tradition of Scientific Writing. To use the current vogue word, the purpose of the class period is to help technical and scientific writers find their "roots." We spend the class period lecturing on the tradition of scientific writing because the students, who are pure and applied science majors, do not seem to know that there is a tradition of scientific writing and they do not know that it is a long and great tradition.

Out of curiosity, we quiz students about the tradition of scientific writing. We ask them these five easy questions:

1. The writing of what ancient scientific writer hangs on the wall of your doctor's office?
2. With what science were Euclid and Nicomachus most closely associated?
3. On what central point of science did Ptolemy and Copernicus disagree?

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4. Within ten years, in what year was Darwin's Origin of Species published?

5. In the early 1900's, who wrote a series of lectures entitled The Origin and Development of Psycho-Analysis?

A few of the students answer the questions correctly. We cannot help laughing, though at some of our students' answers. According to these students, the writing that hangs on the wall of their doctor's office is the writing of Homer or Socrates or Plato or Aristotle or Thomas Jefferson or the writing of that massive intellect of the ancient times, Hercules. For the second question, some students answer that Euclid and Nicomachus were chemists or alchemists or astrologists or astronomers or doctors or engineers. For the third question, some students guess that Ptolemy and Copernicus disagreed on the shape of the earth or genus of man. For the fourth question, students say that Darwin wrote The Origin of Species some time between 1608 and 1958. And for the fifth question, some students write that the author of The Origin and Development of Psycho-Analysis was Eric Berne or Alex Comfort or that perverse purveyor of misinformation David Reuben. In fact, in the last two semesters, out of 150 students in six classes, only one student knew all five answers, 14 knew 4 answers, 29 knew 3 answers, 35 knew 2 answers, 34 knew 1 answer, and 37 could not answer any question correctly.

After revealing to students that they know little about the tradition of scientific writing, we then explain that a long and great tradition of scientific writing exists.

The "roots" of this scientific writing go back to ancient times though such "roots" are not always acknowledged. For instance, it is a common belief that technical writing began after World War II when "industry and government" began "to believe that they demand a special kind of writing from their scientists and

technicians" (Anderson, 1976, p. 1). Though the profession of technical writing did indeed begin shortly after World War II, the tradition of technical and scientific writing is a much longer tradition. As we tell our students, scientific writing originated, at least in the western world, with the ancient Greeks. This origin is acknowledged by Walter James Miller in an essay entitled "What can the Technical Writer of the Past Teach the Technical Writer of Today?" Miller's article, apparently one of Professor Estrin's favorites, is anthologized in Professor Estrin's book Technical and Professional Writing and again in Professors Cunningham and Estrin's book The Teaching of Technical Writing. In his essay, Miller writes of the value of using technical writers of the past. He discusses twelve applied science writers, "dating from ancient times to now (1961), each important not only for what he said but for how he said it" (1975, p. 199). Miller shows, for instance, how the ancient Romans Vitruvius and Frontinus use "timely definitions" and "superb examples" in informational reports on city plans and aqueducts for Rome. He uses the other ten writers to illustrate patterns of organization and approach and to illustrate methods of handling definitions and descriptions of process, apparatus, and theory in reports on mining, engineering, road making, and bridge building (1975, p. 215). He illustrates how the writers of the past can be used today and he indirectly shows that technical and scientific writing has had a long tradition.

This tradition of scientific writing, though, is not only a long tradition; it is also a great tradition. At NMSU, we show students how great that tradition is by using Robert M. Hutchins and Mortimer J. Adler's The Great Books of the Western World. The Great Books is that 54 volume set published by Britannica in 1952, that represents Hutchins and Adler's attempt, when they were both at

the University of Chicago, to return 20th century education to the great books of the centuries as the source of all education worthy of the name.

The inclusion of scientific writing in The Great Books of the Western World demonstrates how great the tradition is. The 54 volume Great Books series begins with 3 introductory volumes. Of the remaining 51 volumes of writing, the great writing of the Western World, 9 volumes are scientific writing. That is almost 1 in 5 volumes. Of some 74 writers, the great writers of the Western World, 20 are scientific writers. That is 1 in 3 and ½ writers, if you can imagine half a writer. These scientific writers are in the same set of books as Homer, as Aeschylus, Sophoclus, and Euripides, as Plato and Aristotle; in the same set of books as Virgil, Plutarch, and Dante, as Shakespeare, Cervantes, and Milton; in the same set of books as Goethe, Tolstoy, and Melville. Their writing is in the same set of books as The Iliad and The Odyssey, as Oedipus Rex, as The Republic and Ethics, as The Aeneid, The Lives, and The Divine Comedy, as King Lear, Don Quixote and Paradise Lost, and as Faust, War and Peace, and Moby-Dick. In other words, we tell our students, these scientific writers are as great as the writers of literature, history, philosophy, and theology. Their writing is as great as the writing in literature, history, philosophy, and theology.

In their first introductory volume, the editors of The Great Books justify their inclusion of these scientific writers and their writing. They say,

> . . . the Editors do not agree that the great poets of every time are to be walked with and talked with, but not those who brought deep insight into the mystery of number and magnitude or the natural phenomena they observed about them. (1952, p. xxiii)

Translated, the editors say here that there is as much reason to read the great scientific writers as to read the great poets. To use the editors' image,

there is as much reason to walk and talk with the great scientific writers as with the great poets; there is as much reason to wrestle at first hand with the problems raised by great scientists as with the problems raised by great poets, novelists, and philosophers. Thus, The Great Books series provides a convenient and accessible collection of great scientific writing from Hippocrates and Galen to William James and Freud.

Incidentally, this tradition of great scientific writing continues in a new series of Great Books. As I worked on this paper, Time magazine timely printed an article on Adler's new 20 volume series of Great Books of the 20th Century. The article, published in the "education" section of Time's March 4, 1977, issue, indicates that the new series will include 131 works by 73 writers. Eight scientific writers and 15 pieces of scientific writing will be included. The new series will provide us with additional evidence for showing how great the tradition of scientific writing is.

However, let me explain how NMSU's technical writing teachers use the present Great Books series in their classes.

Using the scientific volumes of The Great Books, which are conveniently coded in dark green, we give students a familiarity with the tradition of scientific writing, a tradition or "roots" that they sadly lack. In addition, we use the writings to give the students practical exemplars for writing. During the tradition of scientific writing lecture, we answer the five quiz questions and read parts of The Great Books to students to show them what great scientific writing is.

Though it is not scientific writing, we read them Hippocrates' Oath, which some of our nursing students have never heard. We, then, read the table of contents of Hippocrates' writings to show the range of scientific subjects, which run from "ancient medicine" and "acute diseases" to "hemorrhoids" and "the sacred disease."

Next, we show students that Euclid and Nicomachus provide examples of concise definitions in mathematics. Euclid, for instance, concisely writes, "A point is that which has no part" and "A line is breadthless length." Then, for those of us less wise than he, he says, "The extremities of a line are points" (1952, vol. 10, p. 1).

Then, we use the writings of Ptolemy and Copernicus to show students how two scientists present facts to establish similar conclusions for the shape of the earth. Ptolemy does this particularly well in the first book of The Almagest. Listen to his use of simple language and commonplace observations to show that the shape of the earth is a sphere. He writes,

> Now, that also the earth taken as a whole is sensibly spherical, we could most likely think out in this way. For again it is possible to see that the sun and moon and other stars do not rise and set at the same time for every observer on earth, but always earlier for those living towards the orient and later for those living towards the occident. For we find that the phenomena of eclipses taking place at the same time, especially those of the moon, are not recorded at the same hours for everyone--that is, relatively to equal intervals of time from noon; but we always find later hours recorded for observers towards the orient than for those towards the occident. And since the difference in the hours is found to be proportional to the distances between the places, one would reasonably suppose the surface of the earth spherical, with the result that the general uniformity of curvature would assure every part's covering those following it proportionately. But this would not happen if the figure were any other, as can be seen from the following considerations.

Ptolemy, then, shows that the earth could not be concave or flat or could not be a pyramid or a cube. He ends with this good sentence:

> Again, whenever we sail towards mountains or any high places from whatever angle and in what ever direction, we see their bulk little by little

> increasing as if they were arising from the sea, whereas before they seemed submerged because of the curvature of the water's surface.
> (1952, vol. 16, p. 8)

Unfortunately, after using Ptolemy's good writing to prove one scientific conclusion, we have to tell students that Ptolemy writes equally well when he presents facts to show that the earth is the center of the universe.

Then, we discuss Darwin, whose Origin of Species was published on November 24, 1859. Darwin is useful to us because he writes so well of the scientist's intense concern for a presentation of facts to establish conclusions. In the introduction to The Origin of Species, he writes emphatically on the importance of using facts to establish conclusions. For instance, he says, "I can here give only the general conclusions at which I have arrived, with a few facts in illustration . . ." Darwin's few facts are all parts of The Origin of Species. Darwin continues and says, "No one can feel more sensible than I do of the necessity of hereafter publishing in detail all the facts, with references, on which my conclusions have been grounded" (1952, vol. 49, p. 6). Thus, Darwin reinforces the scientist's use of facts to support conclusions.

Lastly, we use Freud's writing to show how a scientist uses excellent examples to support conclusions and to illustrate theories. I am particularly fond of using this example from the second lecture of Origin and Development of Psycho-Analysis to illustrate the excellent use of examples. Freud writes,

> I will not multiply examples but will give you the history of a single one of my cases, in which the conditions and the utility of the repression process stand out clearly enough. Of course, for my purpose I must abridge the history of the case and omit many valuable theoretical considerations. It is that of a young girl, who was deeply attached to her father, who had died a short time before, and whose care she had shared . . . When her older sister married, the girl grew to feel a peculiar sympathy for her new brother-in-law, which passed with her for family tenderness.

> This sister soon fell ill and died, while the patient and her mother were away. The absent ones were hastily recalled, without being told fully of the painful situation. As the girl stood by the bedside of her dead sister, for one short moment there surged up in her mind an idea, which might be framed in these words: "Now he is free and can marry me." We may be sure that this idea, which betrayed to her consciousness her intense love for her brother-in-law, of which she had not been conscious, was the next moment consigned to repression by her revolted feelings. The girl fell ill with severe hysterical symptoms, and when I came to treat the case, it appeared that she had entirely forgotten that scene at her sister's bedside and the unnatural, egoistic desire which had arisen in her. She remembered it during the treatment, reproduced the pathogenic moment with every sign of intense emotional excitement, and was cured by this treatment. (1952, vol. 54, p. 7)

Thus, we show students that the writings of these great writers provide examples of how to discuss scientific and technical subjects. In addition, we show them that the writings of these great writers provide exemplars of good style. In fact, the editors of The Great Books speak of the writing style of these great scientists and say,

> Poor books in science deal with specialties that serve the technician and pride themselves on juggling jargon. But the best books get their power from the refinement and precise use of the common language. As far as the medium of communication is concerned, they are products of the most elegant literary style, saying precisely what is meant. (1952, vol. 1, p. xxiii)

After introducing students to the tradition of scientific writing, we give them an assignment asking them to read one or more pieces of scientific writing in their majors from The Great Books of the Western World and to write a summary of what they read. After the assignment is finished, we get some unusual responses. Unfortunately, after the tradition lecture, we discuss style indexes. Once, when a student turned in an assignment on Newton, he said, "Newton must have a high fog index." Another student, though, responded to the

tradition assignment by saying that he understood Euclid better than he understood his present Math 101 textbook. And many other students discover that they enjoy reading Michael Faraday and William Harvey and, of course, Darwin and Freud.

I think, then, that our tradition lecture at least introduces students to the great scientific writers of the past.

Our nursing and pre-med students are introduced or reminded of the writings of Hippocrates, Galen and William Harvey

Our electrical engineering students examine--perhaps for the first time--the writings of Michael Faraday.

Our wildlife science students are reminded that Charles Darwin wrote well of subjects in the natural sciences.

Our math students see how Euclid, Archimedes, Apollonius, and Nicomachus wrote of numerical quantities.

Our animal science students find that William Harvey wrote on blood systems in animals and wrote well enough to be included in The Great Books.

Our astronomy students examine the writing techniques of Ptolemy, Copernicus, and Kepler.

Our psychology students are reminded of the good writing in psychology in the works of Freud and William James.

And our pure and applied science majors rediscover their "roots" in the writings of Galileo, Newton, Huygens, Gilbert, Lavoisier, and Fourier.

Perhaps what they read even inspires our students a bit. In The Art of Scientific Investigation, which is a classic on scientific method and the psychology of science, W. I. B. Beveridge spoke of such inspiration. Beveridge wrote:

> The scientist will find his life enriched and his understanding of science deepened by reading

> the lives and works of some of the great men of science. Inspiration derived from this source has given many young scientists a vision that they have carried throughout their lives.
> (1975, p. 11)

In addition to possibly gaining a vision, our young scientific and technical writers see that the tradition of scientific writing is a long and great tradition, a tradition that they are to carry on in their own writing.

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